England, to the Silurian uplands of Central Scotland on the north, and those of the Welsh and Cumbrian highlands on the west, and possibly to those of the Scandinavian hills on the north-east. After the formation and consolidation of the Coal-strata, the southern area of this great Carboniferous basin was then subjected to that remarkable disturbance which, for a distance of above 800 miles, exercised that excessive lateral pressure by which the older underlying strata were squeezed and forced up into the series of sharp anticlinals forming the axis of the Mendips and Ardennes, while portions only of the Carboniferous series were preserved from the denudation which followed, in deep synclinal troughs flanking the main axis.

The central and northern portions of the great Carboniferous basin, which were not raised by this disturbance, were then overspread by strata of the Permian series; after which the northern section of the original coal area was traversed by that other great disturbance at nearly right angles to the former one, by which fresh portions of the Coal Measures were brought up in our central and northern counties, still leaving other deeper-seated portions to be afterwards covered by Triassic and Jurassic strata.

At a much later period the emerged southern area of Palæozoic rocks, including the westward prolongation of the great coal-trough of Belgium, or portions thereof, was submerged and covered over by the several formations of the Greensands, Chalk, and Lower Tertiaries now forming the surface of the south-east of England.

The trials to discover these possibly productive coal-basins must necessarily be attended with considerable uncertainty. We shall have to feel our way. Of our hope of their ultimate success I have given you the reasons. Nor could such trials near London scarcely fail of some important results; for, even if we did not hit at first upon the Coal Measures, it is probable that the Lower Greensand would at some spots be reached, so that the inestimable additional benefit of a large and steady supply of pure water might also be obtained, and, with proper care to prevent undue interference, might be maintained for all time.

And now, gentlemen, in retiring from the chair, which I have had the honour to occupy during the last two years, allow me to express the sincere satisfaction I have experienced in witnessing the continued prosperity of the Society, and the unanimity and oneness with which its labours are carried on. It was a post I long hesitated to accept, but which your kind forbearance and the friendly co-operation of your officers, has not only rendered easy, but as pleasant as it has been gratifying. I feel assured of the continued prosperity and usefulness of the Society when I resign my trust into the hands of a nobleman so distinguished as a statesman, so able as a writer, and so long known amongst us an active and zealous geologist, as the Duke of Argyll.

SCIENTIFIC SERIALS

The Lens, a quarterly journal of microscopy and the allied natural sciences, with the Transactions of the State Microscopical Society of Illinois, edited by S. A. Briggs. No. 1, January 1872. Chicago, U.S. This long-promised journal has at length made its appearance, and we learn from its first number that it was printed and ready for the mail when the great fire occurred. With the exception of a few copies, the whole edition was destroyed, and on recovery from that disaster had to be reprinted. We have cause, therefore, to congratulate the publishing committee on recovering themselves so speedily as to issue their first number with the new year. Amongst its contents we note the following:—"Conspectus of the families and genera of the Diatomaceæ," by Prof. H. L. Smith. This is an artificial key, and like all such efforts has its good and bad sides. As a help such guides are useful, but they are seldom satisfactory. A table of synonyms is promised in the next number.—"The Flora of Chicago and its vicinity," by H. H. Babcock, is hardly such a subject as we should expect to find in a microscopical journal, since the list of Phanerogamic plants, with localities, here commenced, contains no single note of microscopical observation. To the local botanist it will probably make amends for this by its practical utility.—"On the preparation and preservation of sections of soft tissues," by Dr. J. N. Danforth, contains practical observations on the preparation of morbid animal tissues without artificial hardening.—"Microscopical Memoranda for the use of Practitioners of Medicine," by Dr. J. J. Woodward, U.S. Army, is the first portion of a more elaborate treatment of the same subject, which is to be contained in succeeding numbers. Dr. Woodward's reputation on this side the Atlantic as a practical microscopist is a sufficient guarantee for these memoranda.—"A new fossil Echinus," by O. S. Wescott, is named by the author *Oligoporus Groveri*, and found in the limestone region of Hancock County, Illinois.—"The Diatomaceæ of Lake Michigan," by S. A. Briggs, is simply a list of species.—"A New Method of Illuminating Opaque Objects under high powers," by Dr. H. A. Johnson. This new method consists in sending a beam of light down the oblique body of the binocular upon the prism, by means of a plane mirror or rectangular prism; by this arrangement objectives as high as $\frac{1}{25}$ in. have been used successfully by daylight and lamplight.—A reprint from the *Monthly Microscopical Journal* and some notes complete the present number. The losses which the Academy of Sciences of Chicago sustained by the late destructive fire are detailed, in so far as the natural history collections and library are concerned. All British naturalists will sympathise with those of Chicago at their irreparable misfortune in such losses as the Smithsonian collection of crustacea, which filled 10,000 jars, and the invertebrates of the U.S. North Pacific Exploring Expedition, besides the thousands of specimens, zoological, botanical, and mineralogical, in the general collection.

Journal of the Chemical Society, Jan. 7, 1872.—Dr. Gladstone has continued his experiments on various essential oils; amongst others he has examined four new oils, those of citron, lign aloes, pimento, and vitivert; the author has separated the hydrocarbons contained in most essential oils into three polymeric groups to which the formulæ $C_{10}H_{16}$, $C_{15}H_{24}$, and $C_{20}H_{32}$, have been assigned. The two bodies first mentioned have the vapour density required by theory, the third has not been examined, the three bodies also differ in their solubility in alcohol, and in their expansibility by heat. The physical properties and chemical composition of several oils have been studied in detail, and are here described. Dr. Armstrong contributes a third paper on the nitrochlorphenols, the results obtained, however, are not suitable for useful abstraction. Amongst the abstracts there is one by E. Budde "on the action of light on Chlorine and Bromine." The author has exposed chlorine to the action of various parts of the solar spectrum, he found that when the bulb of gas was exposed to the violet and ultra-violet rays, there was from six to seven times as great expansion as took place in the red and yellow part of the spectrum. An ordinary differential air thermometer and also one charged with carbonic anhydride and ether, placed in the blue and violet parts of the spectrum, showed no increase in temperature. The author is of opinion that the hypothesis which he has advanced in explanation "that the chemically active light actually decomposes the chlorine molecules into chlorine atoms" is not a little supported by the fact that the rays which cause the expansion of chlorine coincide with those which are known to render it chemically active. The author believes that the light causes the separation of the molecules into atoms, and that the isolated atoms combine again with the production of heat, and thus lead to an increase of temperature which would account for the expansion of the gas as observed.

THE articles of most general interest in the *Journal of the Franklin Institute* for January are by Mr. F. A. Genth, on the Mineral Resources of North Carolina; and by Mr. G. W. Baird, U.S.N., on the Absorption of Gases by Water, and on the organic matters contained therein. The latter contains a series of experiments on the volume of different gases capable of being dissolved in a unit volume of water, and on the amount of oxygen necessary to oxidise the organic matter contained in the water.—The editorial notes contain descriptions of a number of novelties in mechanics and physics.—Mr. J. Farrand Henry continues his series of papers on the Flow of Water in Rivers and Canals, and Mr. J. H. Cooper his article on Belting Facts and Figures.—There is also a report by Mr. W. M. Henderson on some experiments on the explosion of steam-boilers, carried out by a committee of the Franklin Institute at the instance of the engineers of some of the American railways.

THE *American Journal of Science and Art* for February is mainly geological. It commences, however, with some observations by Prof. C. A. Young on Encke's comet, at the Dartmouth College Observatory, accompanied by drawings. He identifies the spectrum with that of Comet II. 1868 (Winnecke's comet) described by Mr. Huggins in the Philosophic Transactions for that year.—Prof. J. D. Whitney has a note on the occurrence of the "Primordial Fauna" of Nevada, which he considers indicates most unequivocally the Potsdam period of the Silurian age, and carries

©1872 Nature Publishing Group

the Primordial Fauna much farther west than it had been found before.—Prof. Dana's notice of the address of Prof. T. Sterry Hunt, before the American Association at Indianapolis has already appeared *in extenso* in our columns.—Prof. Roland Irving on the age of the Quartzites, Schists, and Conglomerates of Sauk Co., Wisconsin, holds them to be unquestionably islands in the Potsdam Sea, furnishing beautiful illustrations of wave action on a rocky coast.—Prof. Hayden gives an extremely interesting account, illustrated by maps, of the hot springs and Geysers of the Yellowstone and Firehole Rivers, the result of the recent Government exploration of that district. Prof. T. Sterry Hunt continues his notes on granite rocks, and Mr. A. S. Verrill his contributions to Zoology from the museum of Yale College.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, April 11.—"Researches on Solar Physics." —III. By Warren De La Rue, F.R.S., Balfour Stewart, F.R.S., and Benjamin Loewy.

The authors present in this paper the third instalment of the determination of the areas and heliographic positions occupied by the sun-spots observed by the Kew photoheliograph, comprising the years 1867, 1868, and 1869. They announce that the fourth and last instalment is in active progress, and will be preceded by the final discussion of the whole ten-yearly period, during which the photoheliograph has been at work. This final discussion will contain the determination of the astronomical elements of the sun on the basis of photographic observations, and this work they anticipate will not only settle the question of rotation for a considerable time to come, but will also throw light upon many points which have only recently been brought under the consideration of scientific men. The results in general, they believe, will prove the superiority of photographic sun-observations over previous methods. The second question which will be discussed is the distribution of sun-spots over the solar surface. The facts already brought out indicate that the progress of the inquiry may lead to some definite laws which regulate the distribution; there appear to exist centres of great activity on the sun, and the different solar meridians seem to have various but definite intervals of rest and activity. In conclusion the authors point out the necessity of devoting in future greater attention to the study of the faculæ, and express a hope of seeing photographic sun-observations carried on in this country on a more extended system, connecting from day to day solar phenomena with terrestrial meteorology and magnetism.

Correction to Messrs. De La Rue, Stewart, and Loewy's papers "On some recent Researches in Solar Physics, &c."

The erroneous date given in our paper for one of Professor Wolf's maxima has already been corrected by us, and we give in the subjoined little table the corrections of the few numerical data which are necessitated by the error of fixing the date of maximum at 1846·6 instead of 1848·6.

Prof. Wolf's ratio $\frac{A}{B}$ (p. 86).

	Erroneous figures given previously.		Differences.	Corrected figures.		Differences.
I.	1·265	Mean 2·093	—0·728	1·265	Mean 1·548	+0·283
II.	2·615		+0·522	1·478		+0·073
III.	2·400		+0·307	1·900		+0·352

The differences derived from our own results are respectively +0·061, and —0·047, that is, they are still much smaller, and agree singly better with the mean, than if Prof. Wolf's ratio were adopted; hence our conclusion is quite unaffected by this correction.

The remark made by us with reference to this maximum will remain in force even with the corrected date. We stated there that this particular maximum showed alone an appreciable difference from the dates fixed by ourselves, for it will be found that Prof. Wolf's date differs still by about three-quarters of a year from ours.

"Contributions to the History of the Opium Alkaloids."—Part V. By Dr. C. R. A. Wright.

"The Action of Oxygen on Copper Nitrate in a state of Tension." By Dr. J. H. Gladstone, F.R.S., and Alfred Tribe, F.C.S.

In our experiments on the action between copper and nitrate of silver in solution, we frequently noticed that the tips of the silver crystals became red, as though coated with a thin layer of metallic copper.

This apparent deposition of a positive on a more negative metal of course raised our curiosity, and led us to look closely into the circumstances under which it occurred. We found that it took place only when the nitrate of silver was exhausted, and only on those silver crystals which remained in metallic connection with the copper. We found, too, that the cupreous coating formed most readily where air had the freest access; and, in fact, that it would not form at all in vessels from which oxygen was excluded, nor on those white crystals which were far below the surface of the liquid, though they might be in immediate contact with the copper plate. When an inverted jar was filled with nitrate of copper solution and silver crystals resting on branches of copper, and the liquid was displaced by oxygen gas, it was found that the tips of the crystals became red, and the solution gradually filled the jar again by the absorption of the gas. In the same way the oxygen was absorbed from air, or from its mixtures with hydrogen or carbonic anhydride. This action was further studied by employing plates of the two metals instead of copper covered with silver crystals. When the two plates, connected by a wire, were partially immersed in an ordinary aqueous solution of copper nitrate, it was found that a slight yellowish deposit made its appearance speedily all over the silver plate, and went on increasing for a day or two, while at the air line there was a thicker deposit, which gradually grew and extended itself a little below the surface. This deposit changed from yellowish to red, and under the microscope presented a distinctly crystalline appearance. Thinking that this slight crust all over the silver plate was due to the air dissolved in the solution itself, we took advantage of the reaction to prepare copper nitrate absolutely free from dissolved oxygen. An ordinary solution of the salt mixed with some silver nitrate was placed in a narrow cylinder, with a long piece of copper foil arranged somewhat spirally so as to retain the deposited silver on its surface, and allowed to rest for twenty-four hours.

The solution thus obtained was exposed to the action of the conjoined copper and silver plates, but even after some hours there was no diminishing of the lustre of the silver plates, except at the air line, which was sharply defined. The same solution shaken for some time in the air produced a yellowish deposit on the white metal in three minutes.

The colour and general appearance of this crust, together with its formation only where oxygen can be absorbed, showed that it was not metallic copper, but the suboxide.

This was further proved by the action of diluted sulphuric acid, which resolves it at once into red metallic copper and copper sulphate. There is also another curious reaction which can only be properly observed under a microscope.

When treated with a solution of silver nitrate, this cupreous deposit does not give the ordinary crystals of the white metal; in fact, it is only slowly acted upon, but presently there shoot forth thin threads of silver which run through the liquid, often twisting at sharp angles, while the yellowish crystals change to black. This also was found to be a property of the suboxide of copper. This deposition of oxide on the silver is accompanied by a corresponding solution of copper from the other plate.

Thus, in an experiment made with nitrate of copper solution that had been exposed to air, and which was allowed to continue for four days, there was found—

Gain of silver plate,	0·016 grm.
Loss of copper plate,	0·015 grm.

The copper necessary for the production of 0·016 grm. of suboxide would be a little above 0·014 grm.

The wire connecting the two plates in this experiment is capable of deflecting a galvanometer. The current takes place from copper through the liquid to silver, that is, in the same direction as if the copper had been dissolved by an acid, and hydrogen evolved on the silver plate.

If the two plates have their sides parallel, the suboxide is deposited not merely on that side of the silver plate which faces the copper, but after about a minute on the other side also, showing that in this, as in other cases, the lines of force curve round.

It became interesting to consider what started this electric current. The original observations convinced us that it was not due to the action of oxygen on the copper; but to make the matter more certain, bright copper and silver plates in conjunc-

©1872 Nature Publishing Group